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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/584,796	06/01/2000	Fredrik Lindqvist	1410-679	4990

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EXAMINER

JAMAL, ALEXANDER

ART UNIT	PAPER NUMBER
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2643

DATE MAILED: 02/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/584,796

Applicant(s)

LINDQVIST ET AL.

Examiner

Alexander Jamal

Art Unit

2643

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-7 and 9-44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-7 and 9-44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☒ Other: PTO-413B.

DETAILED ACTION

Response to Amendment

1. As per the examiner initiated interview on 11-1-2004, the examiner notes that:
 - The finality of the rejection made on 5-15-2004 has been withdrawn
 - The Amendment received on 8-25-2004 has been entered
 - The Advisory action dated 10-14-2004 has been vacated, and a new office action will be issued
2. Based upon the submitted amendments filed 8-25-2004, examiner withdraws the 35 USC 112 rejection to claim 10.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.
4. **Claim 29** rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. The domain of the received signal is critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). Claim 29 depends from claim 20, and claim 20 specifies a 'transceiver canceling an echo from received signal in the **frequency** domain...'. Claim 29 states canceling the echo from the received signal in the time domain. The

Art Unit: 2643

specification does not disclose a single embodiment of the invention that cancels an echo estimate from the received signal in both the time and frequency domains.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. **Claims 1,3-7,9-17,20-43**, rejected under 35 U.S.C. 103(a) as being unpatentable over Ho et al. (5317596), and further in view of Dowling (6597745).

As per **claim 1**, Ho discloses an echo canceller used in a transceiver (ABSTRACT). The device comprises electronic circuitry configured to estimate and remove echo signals in the frequency domain (Fig. 3 Col 5 line 65 to Col 6 line 22). However, Ho does not disclose that the echo signals are estimated with a combination of both a product of a first matrix and transmitted symbol and a product of a second matrix and a previously transmitted symbol.

Dowling teaches an adaptive precoder that enables a block oriented receiver to recover a datastream in the presence of ISI and noise (ABSTRACT) that will reduce computational complexity over previous implementations (Col 2 lines 40-55). He further suggests that the precoder may be implemented in (merged with) an echo canceller (Col

22 lines 1-17). The precoder detects and compensates for noise (and ISI) in the signal using a combination of both a product of a first matrix and transmitted symbol and a product of a second matrix and a previously transmitted symbol (Fig. 5 Col 17 lines 23-65). It would have been obvious to one of ordinary skill in the art at the time of this application to implement the precoder's functionality with Ho's echo canceller to produce an echo signal (in the frequency domain) for the advantage that the precoder (and as such, the echo canceller) takes into account ISI and ICI (noise) and provides reduced computational complexity.

As per **claims 12,24,37,38**, claims rejected for same reasons as claim 1.

Additionally, Dowling discloses that the input signal vector may be multiplied with a column vector (Col 9 lines 15-55).

As per **claims 20,30,35**, claims rejected for same reasons as rejection of claim 1.

Additionally, Dowling discloses that the precoder takes into account the effects of ICI (Col 8 lines 60-67).

As per **claims 3,13,26,32,43**, Dowling discloses that the input vector (and as such, the delayed vector) is hermitian-symmetric and is divided into real and imaginary parts (the imaginary parts are ignored) before matrix processing (Col 9 line 15 to Col 10 line 5).

As per **claims 4,5,22,31**, the first matrix (DOWLING: Figs 3,5) has coefficients that represent how an echo from a currently transmitted signal affects a received signal, and the second Matrix (DOWLING: Figs 4,5) represents how an echo from a previously transmitted signal affects the received signal.

As per **claims 6,7,34,36**, Ho discloses that the circuitry adapts the echo canceller coefficients (coefficients of the matrices) using a difference between the receive signal and the echo estimate signal using an lms algorithm (device 58, Fig. 3, Col 6 lines 50-62).

As per **claim 9**, Dowling discloses that the device may be implemented in a DMT transceiver (ABSTRACT).

As per **claim 10**, Dowling discloses that the Matrices may be $N \times N$ matrices (Col 7 lines 30-50).

As per **claims 11,33,42**, Dowling discloses that the device will function for a vector communication signal (which inherently includes, by definition, the transmit, receive, and echo estimate signals) such as a DMT system with Hermitian symmetric signal points (Col 2 lines 58-67).

As per **claims 14,15,23**, Dowling discloses a compensation (twiddle) factor (applied to both matrices) to compensate the previously transmitted signal that is a complex exponential term (Col 11 line 53 to Col 12 line 25, Col 14 lines 5-15). The twiddle factor is also applied to the triangular submatrix formed to compensate for a cyclic prefix (Col 20 lines 49-60). Dowling also discloses the device is used in a DMT type transceiver (ABSTRACT).

As per **claims 16, 17,27,28,40,41**, Ho discloses that for applications involving asymmetric data, the signal should be decimated or interpolated as appropriate (Col 7 lines 49-62).

As per **claim 21**, claim rejected for same reasons as rejections of claims 1 and 9.

As per **claim 25,39**, the matrix is combined with a difference between the current transmit signal and the product of the delayed signal (previously transmitted) and the compensating factor in the matrix (as per rejection of claim 14) (DOWLING: Fig. 5).

7. **Claims 18,19** rejected under 35 U.S.C. 103(a) as being unpatentable over Chaffee et al. (5117418), and further in view of Dowling (6597745).

As per **claim 18**, Chaffee discloses an echo canceller used in a transceiver (ABSTRACT). The device comprises electronic circuitry configured to estimate echo signals in the frequency domain, convert the estimate to the time-domain, then subtract the estimate in the time domain (Col 3 line 5 to Col 4 line 10). However, Chaffee does not disclose that the echo signals are estimated with a combination of both a product of a first matrix and transmitted symbol and a product of a second matrix and a previously transmitted symbol.

Dowling teaches an adaptive precoder that enables a block oriented receiver to recover a datastream in the presence of ISI and noise (ABSTRACT) that will reduce computational complexity over previous implementations (Col 2 lines 40-55). He further suggests that the precoder may be implemented in (merged with) an echo canceller (Col

22 lines 1-17). The precoder detects and compensates for noise (and ISI) in the signal using a combination of both a product of a first matrix and transmitted symbol and a product of a second matrix and a previously transmitted symbol (Fig. 5 Col 17 lines 23-65). It would have been obvious to one of ordinary skill in the art at the time of this application to implement the precoder's functionality with Chaffee's echo canceller to produce an echo signal (in the frequency domain) for the advantage that the precoder (and as such, the echo canceller) takes into account ISI and ICI (noise) and provides reduced computational complexity.

As per **claim 19**, claim rejected for same reasons as rejection of claim 18.

Additionally, Dowling discloses that the input signal vector may be multiplied with a vector (Col 9 lines 31-55).

8. **Claim 44** rejected under 35 U.S.C. 103(a) as being unpatentable over Chaffee et al. (5117418) as applied to claim 35, and further in view of Dowling (6597745).

As per **claim 44**, Chaffee discloses an echo canceller used in a transceiver (method of reducing an echo) (ABSTRACT). The device comprises electronic circuitry configured to estimate echo signals in the frequency domain, convert the estimate to the time-domain, then subtract the estimate in the time domain (Col 3 line 5 to Col 4 line 10). However, Chaffee does not disclose that the echo signals are estimated with a combination of both a product of a first matrix and transmitted symbol and a product of a second matrix and a previously transmitted symbol.

Dowling teaches an adaptive precoder that enables a block oriented receiver to recover a datastream in the presence of ISI and noise (ABSTRACT) that will reduce computational complexity over previous implementations (Col 2 lines 40-55). He further suggests that the precoder may be implemented in (merged with) an echo canceller (Col 22 lines 1-17). The precoder detects and compensates for noise (and ISI) in the signal using a combination of both a product of a first matrix and transmitted symbol and a product of a second matrix and a previously transmitted symbol (Fig. 5 Col 17 lines 23-65). It would have been obvious to one of ordinary skill in the art at the time of this application to implement the precoder's functionality with Chaffee's echo canceller to produce an echo signal (in the frequency domain) for the advantage that the precoder (and as such, the echo canceller) takes into account ISI and ICI (noise) and provides reduced computational complexity.

Response to Arguments

9. Applicant's arguments filed 8-25-2004 have been fully considered but they are not persuasive.

As per applicant's arguments on the finality of the office action ('Remarks' page 10), the finality of the previous office action has been withdrawn.

As per applicant's arguments concerning the 112 first paragraph rejection of claim 29, applicant states that claim 29 has been cancelled but on the 'Listing of Claims'

received with the amendment, claim 29 has not been cancelled. Furthermore, although applicant's specification states that the asynchronous echo canceller may be combined with any other embodiments, the applicant's specification fails to specify how two echo cancellers would be combined such that they are canceling echo in both the time and frequency domain.

As per applicant's arguments regarding the 103 rejection of claims 1,3-7,9-17,20-43, the Dowling reference is used to teach a method of coding/decoding signals to take into account ISI and ICI. Dowling (Col 22 lines 1-3) states that the pre-coder can be used with echo cancellers. When the Ho and Dowling references are combined, the echo canceller of Ho will estimate and remove echoes based upon the signal received on the transmission line. This signal will be the coded signal taught by Dowling. The combined Ho-Dowling device will have an echo canceller that uses the received coded signal (that is based upon the product of matrices of transmitted signals) to generate echo canceling signals. The combination of Ho and Dowling does read on the claims as written.

As per applicant's argument regarding the 103 rejection of claims 18 and 19, again, the Dowling reference is used to teach the use of precoded signals in systems that may include echo cancellers. When combined with the echo canceller taught by Chaffee, the echo canceller will use the received coded signal (that is based upon the product of matrices of transmitted signals) to generate echo canceling signals. As per the combination of the Dowling and Chaffee references, the precoded signal by Dowling is transformed into the time domain before transmission (DOWLING: Fig. 3, IFFT 320).


Art Unit: 2643

As such it is received by the echo canceller of the Chaffee reference as a normal incoming signal that is utilized by the echo canceller function of Chaffee.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander Jamal whose telephone number is 703-305-3433. The examiner can normally be reached on M-F 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis A Kuntz can be reached on 703-305-4708. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9306 for regular communications and 703-872-9315 for After Final communications.

AJ
February 8, 2005


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